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ABSTRACT

This study investigated issues related to the project-based learning (PBL) approach using Web technology. Action research methodology was employed for the investigation. Data included online discussions, an online questionnaire, and the transcripts of face-to-face instruction. Content analysis was used for data analysis. The findings showed that students required more scaffolds to become active learners and assume their learning responsibility. Their abilities of searching information, using technology, and keyboarding also influenced their learning and participation. In addition, a powerful, stable, learner-centered system was needed to implement project-based learning effectively. Finally, the instructor's skills in dealing with emotional issues are important to successful online learning. (Contains 24 references.) (Author)

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Abstract : This study investigated issues on the project-based learning (PBL) approach with web technology. Action research methodology was employed for the investigation. Data included online discussions, an online questionnaire, and the transcripts of face-to-face interactions. Content analysis was used for data analysis. The findings showed that students required more scaffolds to become active learners and assume their learning responsibility. Their abilities of searching information, usingtechnology , and keyboarding also influenced their learning and participation. In addition, a powerful, stable, learner-centered system was needed to implement project-based learning effectively. Finally, the instructor's skills in dealing with emotional issues are important to successful online learning.

Introduction

Project-based learning has a potential to overcome inert knowledge. With PBL, learners have opportunities to foster their skills of inquiry, critical thinking and reflections by involving themselves in an authentic, complex learning context. Consequently, PBL serves precisely the need of connecting knowledge to the contexts of its application. However, to implement PBL requires a resource-based learning environment that augments collaboration, communication, reflection and authentic assessment. Web technology enables educators to create such a rich resource-based learning environment. Therefore, the paper intended to discuss critical issue in implementing PBL in a web-based learning environment from a teacher-researcher perspective. First, the rationale for the course and research design is presented, then, the research results and finally the reflection on teaching based on literature.

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Rationale

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It is a necessity for educators to arrange the kind of present experiences that live fruitfully and creatively in subsequent experiences according to Dewey (1953). Educators have the responsibility of being aware that environments can shape student's actual experience and recognizing what surroundings are conducive to learning experiences leading to growth. School education must give each present experience a worthwhile meaning, and should be an ever-present process if knowledge application in the real world is expected.

Students are motivated to deepen their understanding of key concepts and sharpen their skills if they perceive the apparent connection between what they learn in school and its potential uses of that knowledge in real world situations (Steinberg, 2000). One goal of project-based learning (PBL) is for students to learn, and be able to use formal knowledge in an authentic and complex setting (Barron, Schwartz, Vye, Moore, Petrosino, Zech, Bransford, & the Cognition and Technology Group at Vanderbilt., 1998). PBL is intended to combat the inert knowledge and to enhance learning by engaging students in authentic, real world task as that in professional situations (Guzdial, 1998; Laffey, Tupper, Musser, & Wedman, 1998; Poell, Van Der Krogt, & Warmerdam, 1998; Schwartz, Brophy, Lin, & Bransford, 1999; Steinberg, 2000). However, PBL also challenges students and teachers and overwhelms the cognitive support structures found in contemporary education (Laffey et al., 1998).

Web-based instruction is an application of a repertoire of cognitively oriented instructional strategies implemented within a constructivist and collaborative learning environment, utilizing the attributes and resources of the Web (Relan & Gillani, 1997). According to Relan & Gillani, the assumptions of WBI are as follows: (a) the learner has access to the Web at all times and is allowed to explore it in a self-determined or guided sequence, (b) WBI would function best in a constructivist environment, (c) teachers as a facilitator for finding, assessing, and making meanings from the information discovered from a variety of media, and (4) learning occurs in an interdisciplinary fashion without regard to the attainment of learning objectives within a fixed time frame. Therefore, this study was to implement PBL in a web-based learning environment on the course of Introduction of Education.

Research Design

Course Design

Based on the aforementioned rationale, the course design for this study was anchored in the issue of network-café, which was a nation-wide hot issue at the time. Each group conducted a self-directed project to present their perspective on the issue based on the knowledge domain they chose (ex. parenting, educational psychology, etc.). The first three weeks were devoted to the introduction of the course, the web-based learning environment, and the Software of Netmeeting in face-to-face classroom settings. The following five weeks were online roundtable meetings on the issue of network-café focusing on specific topics (e.g. family relationship). There were students - teacher online group meeting during the 9^{th} and 10^{th} week. In the week of midterm, the software of Media Master Recorder was taught to two representatives of each group in a face-to-face setting for their project purpose. Students submitted their project in a written format at midterm and critiqued peer's work online. Then, they were asked for

revising their work based on both their peers' and the teacher researcher's feedback. Finally, they submitted their project in the format of oral presentation clip with text for the grade. A face-to-face self-evaluation meeting was held in the last week. An online questionnaire was administered after the final meeting during the same week and the following one.

Subjects, Data Collection and Data Analysis

Forty-six students participated in this study. Most were freshmen majoring in Special Education except for two freshmen majoring in Guidance & Counseling, two graduates in Special Education and one graduate from Science Education. Data collection included student-teacher interactions via online synchronous discussion and e-mail, face-to-face meetings, online roundtable meetings, online asynchronous discussions, the online questionnaire, and the transcript of self-evaluation meeting. Content analysis was used for data analysis. The framework of "teaching presence" by Anderson, Rourke, Garrison, & Archer (2001) was used as a reference to analyze the data mentioned above.

Results

The results showed that the teacher researcher made efforts on scaffold student learning by teaching them how to learn. The pattern of teacher researcher's teaching is outlined as follows: asking students to articulate what they learned from their reading, to explain the relevance of their reading to group project or the anchored issue, and to request a practical action plan for their proposed ideas or solutions. In addition, the teacher researcher facilitated discourse by presenting probing questions: clarification, explanation, challenging, and making meaningful connection.

Although the teacher researcher put efforts on facilitating discourse by using probing questions, students expected more direct instruction. Their learning motivation was declined because they were not goal-driven for their project. Neither did they obtain more comprehension about the issue of network-café, nor did they deepen their understanding of the subject matter of their study. They felt overwhelmed by their project because of lacking domain knowledge. They did not know how to delineate their project and find useful resources. They were also tired of discussing the same issue for the whole semester without any in-depth deliberation. They suggested that a variety of issues should be included in the course and believed they would have done better if more lectures were given in traditional face-to-face settings.

Students preferred face-to-face interaction rather than online interaction. They felt the sense of *reality* via face-to-face interaction. One student pointed out that none of them had experience on web-based learning and were not ready to be an active learner. They expected lectures and answers from the teacher. He suggested to devote a half of

the class time to the lectures in the traditional classroom setting to serve as a transition. The majority of those who voted for face-to-face class meeting agreed with him.

The results also revealed that most of their group discussions were held in a face-to-face setting. Their participation in online asynchronous discussion was declining from the beginning to the end of the semester. Convenience was a factor. It was more convenient for them to discuss face-to-face because most of them took the same other courses. They met each other quite often. They further identified two major reasons for their avoiding online interaction: lack of keyboarding skills and the stability of the university network system. In fact, both students and the teacher researcher were overwhelmed by the technical problems of the web-based learning environment.

Most students were frustrated by insufficient computer skills that made their learning more time consuming. In fact, their learning time was doubled in comparison with those courses taught in the traditional setting. The time was spent in acquiring computer skills rather than learning domain knowledge. However, the intimacy of peer rapport was enhanced because they often worked out technical problems together.

Reflections

Balance between Structured Instruction and Empowerment Learning

PBL requires the balance between structuring learning and empowering individual in their learning. Deep learning does not occur with PBL if "doing" of a project takes precedent over "doing with understanding" because students do not have a driving question that fosters focused inquiry (Barron et al. 1998). Students' learning outcome of this study corresponded to the assertion by Barron et al. Students needed scaffold to transit from a teacher-centered approach to a learner-centered approach. Teachers should provide instructional scaffolding in encouraging goal-driven and meta-cognitive processing if project-based learning is considered (Barron et al. 1998; Laffey et al., 1998; Land & Greene, 2000).

Requirement of Domain Knowledge, System Knowledge, and Meta-cognition

Students participated in this study encountered serious difficulty of finding valuable information for their project because of lacking domain knowledge, system knowledge and meta-cognition. Traditional teacher-directed education creates a fundamental problem for project-based learning that emphasizes exploration and learner-centered thinking (Hill & Hannafin, 1997). Simply providing access to information does not guarantee effective learning (Land & Greene, 2000). Scaffolding students in fostering divergent thinking, multiple perspective building, critical

thinking and problem solving is needed to help them adapt project-based learning. (Hill & Hannafin, 1997). The interplay between meta-cognition and domain knowledge are critical to the success in project-based learning.

Strategies for Leading to Active Learning and Reflection

Learning-community is critical to online learning (Palloff & Pratt, 2001; Poell et al., 1998; White &Weight, 2000). Interacting with instructors and their peers is essential if they are to master the concepts and skills associate with their profession (Ferry, Kiggins, Hoban, & Lockyer, 2000). The teacher researcher recognized the importance of online discourse and made efforts on facilitating discourse by probing questions. Unfortunately, the students did not have the sense of learning community and their participation was declined. According to Wang & Bonk (2001), online discussion is fostered by significant task structuring, controversial topics, student ownership, instructor modeling of system use, and role play. It also requires students to share thoughts, and analyze and critique others' thoughts (Wang & Bonk, 2001). Reflecting on the course design, the learning activities included the above elements by Wang & Bonk (2001). However, online discussion died for lack student active learning and effective self-reflection. Land & Greene (2000) assert that a learner-generated "need to know" is critical for purposeful knowledge-building. Students' active learning is critical to online learning (Harasim, Hiltz, Teles & Turoff, 1997; Palloff & Pratt, 2001; Simonson, Smaldino, Albright & Zvack, 2000). It is important to balance action and reflection, as well as facilitator intervention in project-based learning (Poell et al., 1998). The missing puzzle was what practical strategies would lead students to active learning and reflection.

Support of Learner-Centered Technology

Technology must provide scaffolds for a learner-centered approach requiring context-driven and individualized learning skills that not well cultivated in current educational system. Technological scaffolding for authentic inquiry must legitimately support and be aligned with both the teachers' interests in assessing student work, and the students' needs for support of the fluid and dynamic aspects of inquiry (Laffey et al., 1998). It is critical whether the assessment practices correspond to the goals and philosophies of project-based learning (Schwartz et al., 1999). Researchers have proposed models for technological support in project-based learning (e.g. Guzdial, 1998; Hill & Hannafin, 2001; Laffey et al., 1998; Schwartz et al., 1999).

Implementing PBL became cumbersome and impossible without the support of learning-centered technology. The web-based learning environment used for this study tended to be a teacher-centered design in comparison with the above models. The teacher researcher could not implement some online learning activities to get more student involvement (e.g. peer evaluation, sharing useful online resources etc.) because of the technology limitation. Consequently, a powerful learner-centered technology is a necessity to implement project-based learning on the Web.

Skills for Handling Emotional Issue

Establishing social organizations that promote participation is important to PBL (Barron et al., 1998). Palloff & Pratt (2001) emphasized the importance of creating a social context for participants to share their lives with each other to promote the intimate friendship in web-based learning. The "Café of Mood" was originally designed as a social organization by the teacher researcher. Unfortunately, the "Café of Mood" did not function as expected but became a discouragement to the teacher researcher because students posted their complaints on it. Some students indicated that they were too busy to participate in course discussion, but spent lots of time posting many complaints on the "Café of Mood." Such online student behaviors frustrated and disappointed the teacher researcher. The frustration, disappointment and discouragement impacted the student-teacher relationship negatively. This was an unexpected consequence.

A web-based PBL as a learner-centered approach is an educational paradigm shift for both the instructor and the students. The challenge for both teachers and students is to re-think their roles and responsibilities in the learning process (Anderson et al., 2001; Gersh, 2001; Hanna, Glowacki-Dudka, Conceição-Runlee, 2000; Kochtanek & Hein, 2000; Lawlor, 2000; Palloff & Pratt, 2001; Wang & Bonk, 2001). The change of teacher's role is both an emotional and a pedagogical challenge (Shrivastava, 1999). The paradigm shift arouses student resistance of change (Huba & Freed, 2000). Therefore, the teacher researcher needs skills to handle such emotional problems.

Conclusion

Teachers need help to be a coach and a facilitator. Students need support for taking self-directed projects, not just carrying out tasks assigned by the teacher. Both of them require new skills, approaches, resources and support systems while engaging in project-based inquiry (Laffey et al., 1998). Teachers require practical knowledge to balance empowering student learning on structured instruction. They also require practicable strategies that lead students to become active and self-reflection learners. They must scaffold students to acquire domain knowledge, system knowledge, and meta-cognition that are critical to the effective learning in web-based, project-based learning. A powerful learner-centered technology can support both teachers and students to effectively handle the challenge of the paradigm shift from teacher-centered to learner-centered. Finally, teachers should increase the level of tolerance to students' negative emotion and have skills for handling such emotional issues.

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